Supplementary data

Substance use during imprisonment in low- and middle-income countries

Web Appendix 1. General search string

Prison condition:

Prison* OR imprison* OR sentence* OR remand* OR jail* OR correctional OR "criminal justice"

Epidemiological studies:

Epidemiology (Subject Heading) OR prevalence OR incidence

Mental health outcome:

Mental Disorders (Subject Heading) OR Substance-Related Disorders (Subject Heading) OR psychiatr* OR psycholog* OR smok* OR alcohol* OR substance OR drug OR addict* OR inject*

Limit: 1987 to March 2017

Web Table 1. Database searches

SOURCES (11)		
Prison	**Epidemiology**	**Mental health**
Applied Social Sciences Index and Abstracts (ASSIA) (24/3/2017) (516)*		
psychiatr* OR psycholog* OR smok* OR alcohol* OR substance OR drug OR addict* OR inject* (227,050)	prevalence OR incidence OR su.Exact("epidemiology") (30,037)	(su.Exact("substance-related disorders") OR su.Exact("substance abuse" OR "substance abuse disorders")) OR (psychiatr* OR psycholog* OR smok* OR alcohol* OR substance OR drug OR addict* OR inject*) (17,392)
CAB Abstracts *1973 to 2017 Week 11* (24/3/2017) (225)*		
(Prison* or imprison* or sentence* or remand* or jail* or correctional or criminal justice).mp (2,003)	epidemiology/ or (prevalence or incidence).mp. (422,950)	mental disorders/ or substance abuse/ or (psychiatr* or psycholog* or smok* or alcohol* or substance or drug or addict* or inject*).mp. (792,500)
Criminal Justice Database (24/3/2017) (607)*		
all(Prison* OR imprison* OR sentence* OR remand* OR jail* OR correctional OR "criminal justice") (135,926)	all(prevalence OR incidence) OR su.Exact("epidemiology") (13,226)	su.Exact("mental disorders") OR su.Exact("substance-related disorders") OR all(psychiatr* OR psycholog*

		OR smok* OR alcohol* OR substance OR drug OR addict*OR inject*) (149,574)
Embase ***1980 to 2017 Week 12*** **(24/3/2017) (3518)***		
(Prison* or imprison* or sentence* or remand* or jail* or correctional or criminal justice).mp. (55,127)	epidemiology/ or (prevalence or incidence).mp. (1,863,770)	mental disease/ or substance abuse/ or "substance use"/ or (psychiatr* or psycholog* or smok* or alcohol* or substance or drug or addict* or inject*).mp. (9,217,897)
Global Health ***1973 to 2017 Week 11*** **(24/3/2017) (857)***		
(Prison* or imprison* or sentence* or remand* or jail* or correctional or criminal justice).mp (3,264)	epidemiology/ or (prevalence or incidence).mp. (298,177)	mental disorders/ or substance abuse/ or (psychiatr* or psycholog* or smok* or alcohol* or substance or drug or addict* or inject*).mp. (503,739)
International Bibliography of the Social Sciences (IBSS) (24/3/2017) (1098)*		
Prison* OR imprison* OR sentence* OR remand* OR jail* OR correctional OR "criminal justice" (37,180)	su.Exact("epidemiology") OR (prevalence OR incidence) (21,074)	su.Exact("mental disorders") OR su.Exact("substance abuse" OR "substance use") OR (psychiatr* OR psycholog* OR smok* OR alcohol* OR substance OR drug OR addict* OR inject*) (172,839)
LILACS (4/4/2017) (41)*		
prison$ OR imprison$ OR sentence$ OR remand$ OR jail$ OR correctional OR criminal justice [Words] (1362)	epidemiolog$ OR prevalence OR incidence [Words] (108,772)	mental OR substance OR psychiatr$ OR psycholog$ OR smok$ OR alcohol$ OR substance OR drug OR addict$ OR inject$ [Words] (136,139)
MEDLINE***(R) Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily and Ovid MEDLINE(R) 1946 to Present*** **(24/3/2017) (2406)***		
(Prison* or imprison* or sentence* or remand* or jail* or correctional or criminal justice).mp. (46,512)	Epidemiology/ or (prevalence or incidence).mp. (1,234,033)	Mental Disorders/ or Substance-Related Disorders/ or (psychiatr* or psycholog* or smok* or alcohol* or substance or drug or addict* or inject*).mp. (4,241,016)
PAIS Index (3/4/2017) (93)*		
prison* OR imprison* OR sentence* OR remand* OR jail* OR correctional OR "criminal justice" (17,806)	su.Exact("epidemiology") OR (prevalence OR incidence) (6,750)	su.Exact("mental disorders") OR su.Exact("substance abuse") OR (psycholog* OR smok* OR alcohol* OR substance OR drug OR addict* OR inject*) (36,460)
PsycINFO ***1806 to March Week 3 2017*** **(24/3/2017) (1620)***		
(Prison* or imprison* or sentence* or remand* or jail*	epidemiology/ or (prevalence or incidence).mp. [mp=title, abstract, heading word, table of	mental disorders/ or "substance use disorder"/ or (psychiatr* or psycholog* or smok* or

or correctional or criminal justice).mp. (73,554)	contents, key concepts, original title, tests & measures] (149,748)	alcohol* or substance or drug or addict*OR inject*).mp. (1,176,019)
Scopus (24/3/2017) (4,580)*		
TITLE-ABS-KEY (prison* OR imprison* OR sentence* OR remand* OR jail* OR correctional OR "criminal justice") (141,178)	(TITLE-ABS-KEY (epidemiolog* OR prevalence OR incidence) (2,158,208)	TITLE-ABS-KEY (mental OR substance OR psychiatr* OR psycholog* OR smok* OR alcohol* OR substance OR drug OR addict* OR inject*) (10,794,492)
Social Services Abstracts (24/3/2017) (197)*		
Prison* OR imprison* OR sentence* OR remand* OR jail* OR correctional OR "criminal justice" (6,532)	su.Exact("epidemiology") OR (prevalence OR incidence) (8,922)	su.Exact("substance-related disorders" OR "substance abuse" OR "substance abuse disorders") OR su.Exact("mental disorders") OR (psychiatr* OR psycholog* OR smok* OR alcohol* OR substance OR drug OR addict* OR inject*) (56,065)

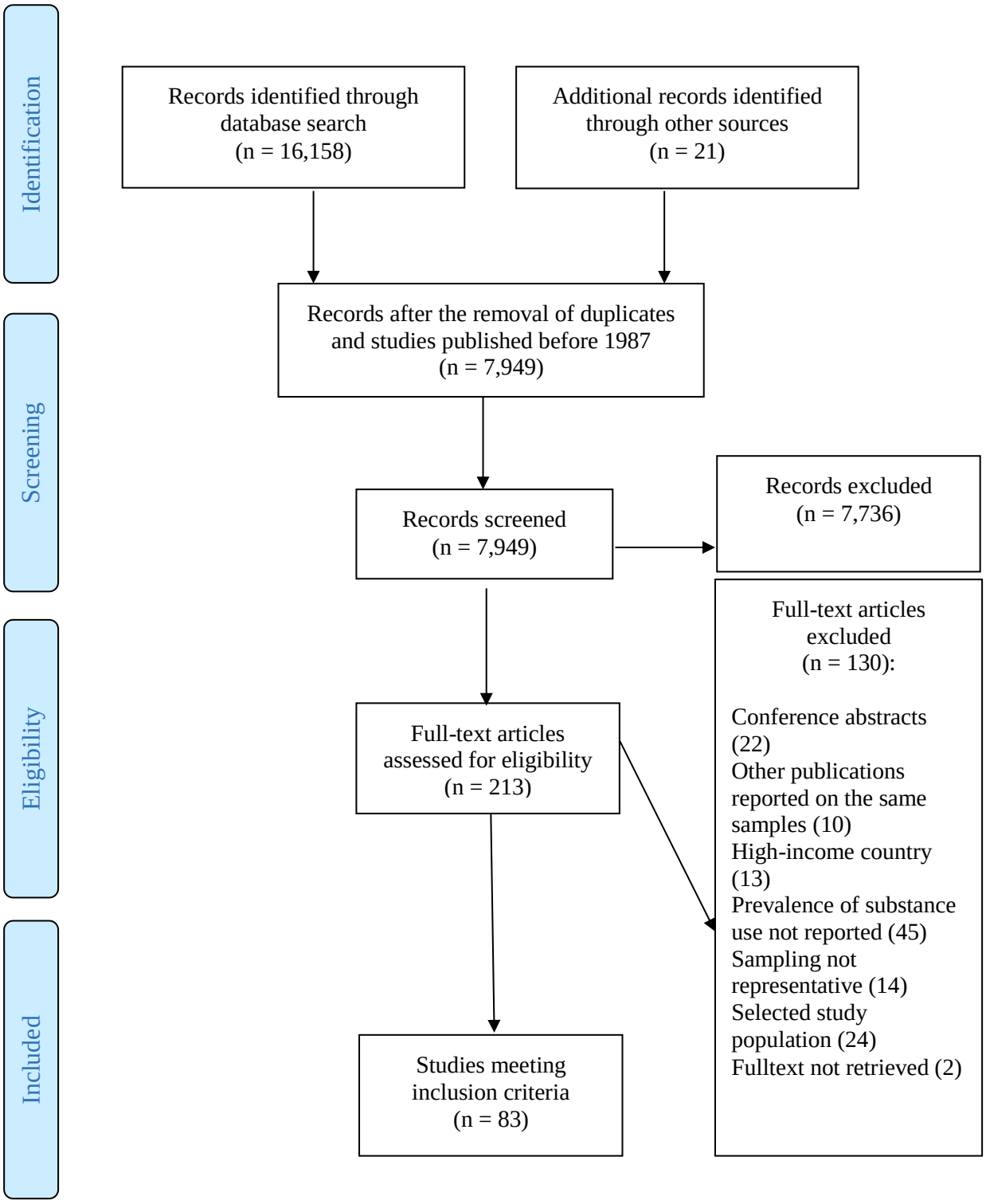
**Number after discarding duplicates*

Web Table 2. Grey Literature

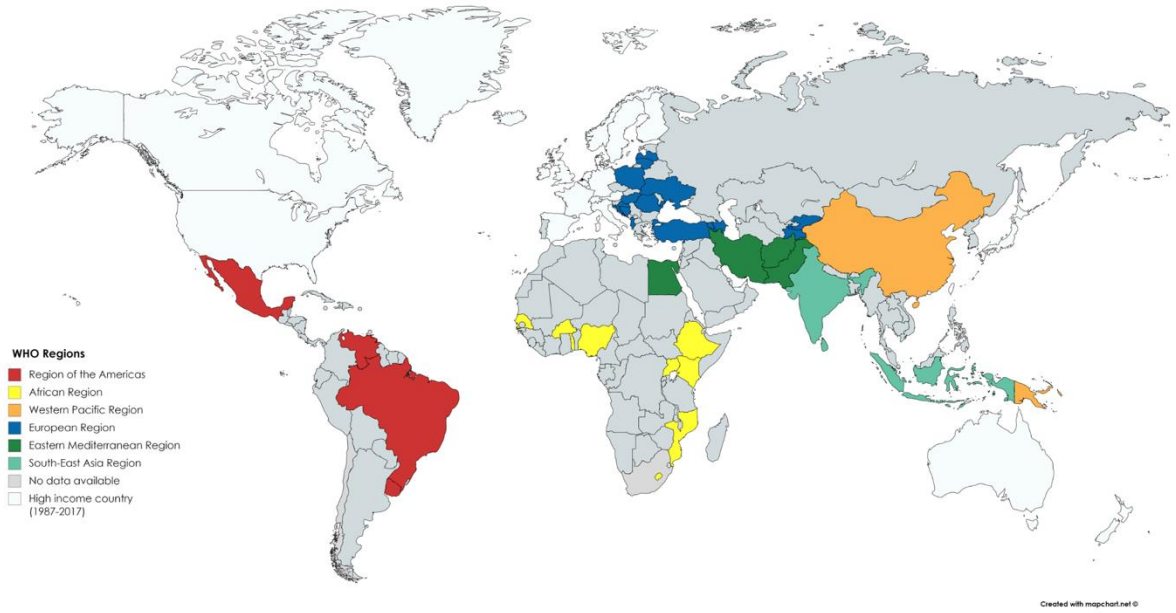
SOURCES (2)		
Prison	**Epidemiology**	**Mental Health**
Open Grey (03/4/2017) (25)†		
prison* OR imprison* OR sentence* OR remand* OR jail* OR correctional OR "criminal justice" (3587)	epidemiolog* OR prevalence OR incidence (14,287)	mental OR substance OR psychiatr* OR psycholog* OR smok* OR alcohol* OR substance OR drug OR addict* OR inject* (80,467)
ProQuest Dissertations & Theses Global (3/4/2017) (375)*		
all(prison* OR imprison* OR sentence* OR remand* OR jail* OR correctional OR "criminal justice") (33,981)	all(prevalence OR incidence) OR su.Exact("epidemiology") (68,101)	su.Exact("drug abuse" OR "drug use" OR "mental disorders") OR all(psycholog* OR smok* OR alcohol* OR substance OR drug OR addict* OR inject*) (593,744)

**Number after discarding duplicates*

†Hits were not exported in reference manager



Web Figure 1. PRISMA Flow-Chart of studies identified, screened and included in the systematic review on the prevalence of substance use in prison populations in low- and middle-income countries between 1987 and 2017.



Web Figure 2. Map of low- and middle-income countries with data reporting substance use of imprisoned people by WHO-regions. Light grey are countries that have been in the high-income category since the implementation of the categories in 1987. Dark grey represents low- and middle-income countries without identified data.

Web Table 3. Meta-regression analyses of study characteristics and the prevalence of nicotine use among people who are imprisoned in low- and middle-income countries.

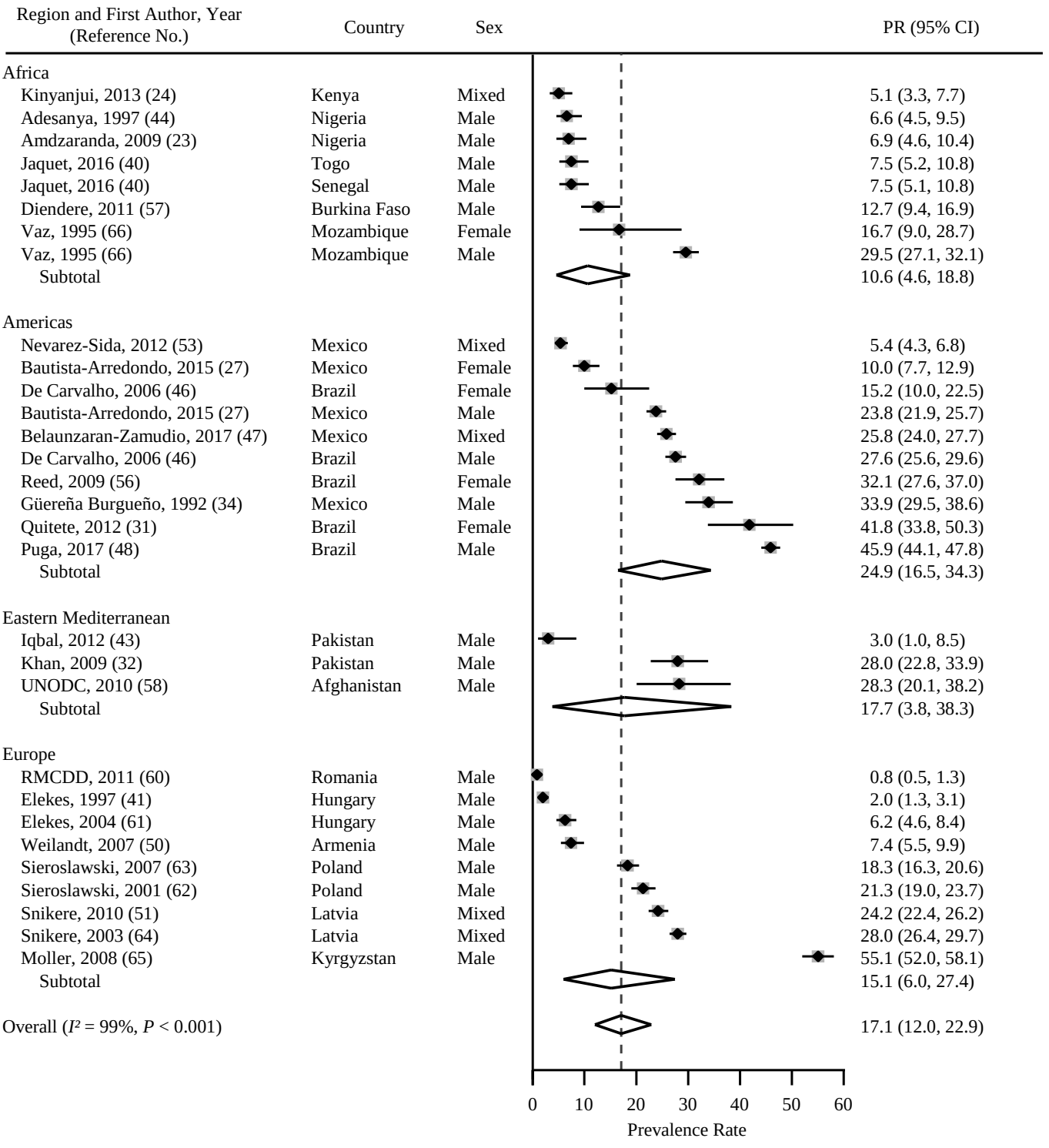
Substance	**Nicotine use**							
Prevalence period	***Before imprisonment***				***During imprisonment***			
	Coefficient (ß)	95% CI		P	Coefficient (ß)	95% CI		P
		lower	upper			lower	upper	
Sex	0.209	0.015	0.403	**0.036**	-0.086	-0.353	0.181	0.510
Age	-0.009	-0.044	0.027	0.612	0.001	-0.032	0.035	0.927
Sample size	2.94e-06	-0.0001	0.0001	0.930	0.00001	-0.0001	0.0001	0.844
Non-response rate	0.001	-0.003	0.005	0.582	0.003	-0.001	0.007	0.167
Before imprisonment	n.a.				0.00006	-0.00013	0.00025	0.490
WHO-regions (Africa Reference category)								
Americas	0.086	-0.129	0.300	0.408	0.327	0.035	0.619	**0.030**
Eastern Mediterranean	0.210	-0.012	0.432	0.062	0.277	-0.046	0.600	0.068
Europe	0.278	0.082	0.474	**0.009**	0.484	0.234	0.734	**0.001**
South East Asia	0.088	-0.160	0.336	0.463	0.286	-0.027	0.600	0.071
Western Pacific	0.186	-0.049	0.420	0.112	0.250	-0.048	0.941	0.074
Multivariate meta-regression analyses retaining significant variables								
Sex	0.198	0.000	0.386	**0.050**				
Europe	0.236	0.069	0.402	**0.009**				

Web Table 4. Meta-regression analyses of study characteristics and the prevalence of alcohol use among people who are imprisoned in low- and middle-income countries.

Substance	**Alcohol use**							
Prevalence period	***Before imprisonment***				***During imprisonment***			
	Coefficient (ß)	95% CI		P	Coefficient (ß)	95% CI		P
		lower	upper			lower	upper	
Sex	0.166	-0.031	0.364	0.094	0.145	-0.320	0.612	
Age	-0.003	-0.043	0.037	0.879	-0.016	-0.051	0.019	0.345
Sample size	-0.000013	-0.0001	0.00005	0.680	-0.00001	-0.00008	0.00006	0.707
Non-response rate	0.003	-0.002	0.008	0.174	-0.002	-0.010	0.005	0.546
Before imprisonment	n.a.				-0.00001	-0.00006	0.00005	0.750
WHO-regions (Africa Reference category)								
Americas	-0.012	-0.159	0.134	0.864	0.174	-0.089	0.437	0.178
Eastern Mediterranean	-0.278	-0.476	-0.079	**0.009**	-0.041	-0.517	0.435	0.855
Europe	0.151	-0.002	0.303	**0.052**	0.037	-0.225	0.299	0.765
South East Asia	-0.179	-0.420	0.063	0.137	-0.100	-0.557	0.357	0.644
Western Pacific	0.081	-0.107	0.269	0.378	-0.009	-0.498	0.481	0.970

Web Table 5. Meta-regression analyses of study characteristics and the prevalence of illicit drug use among people who are imprisoned in low- and middle-income countries.

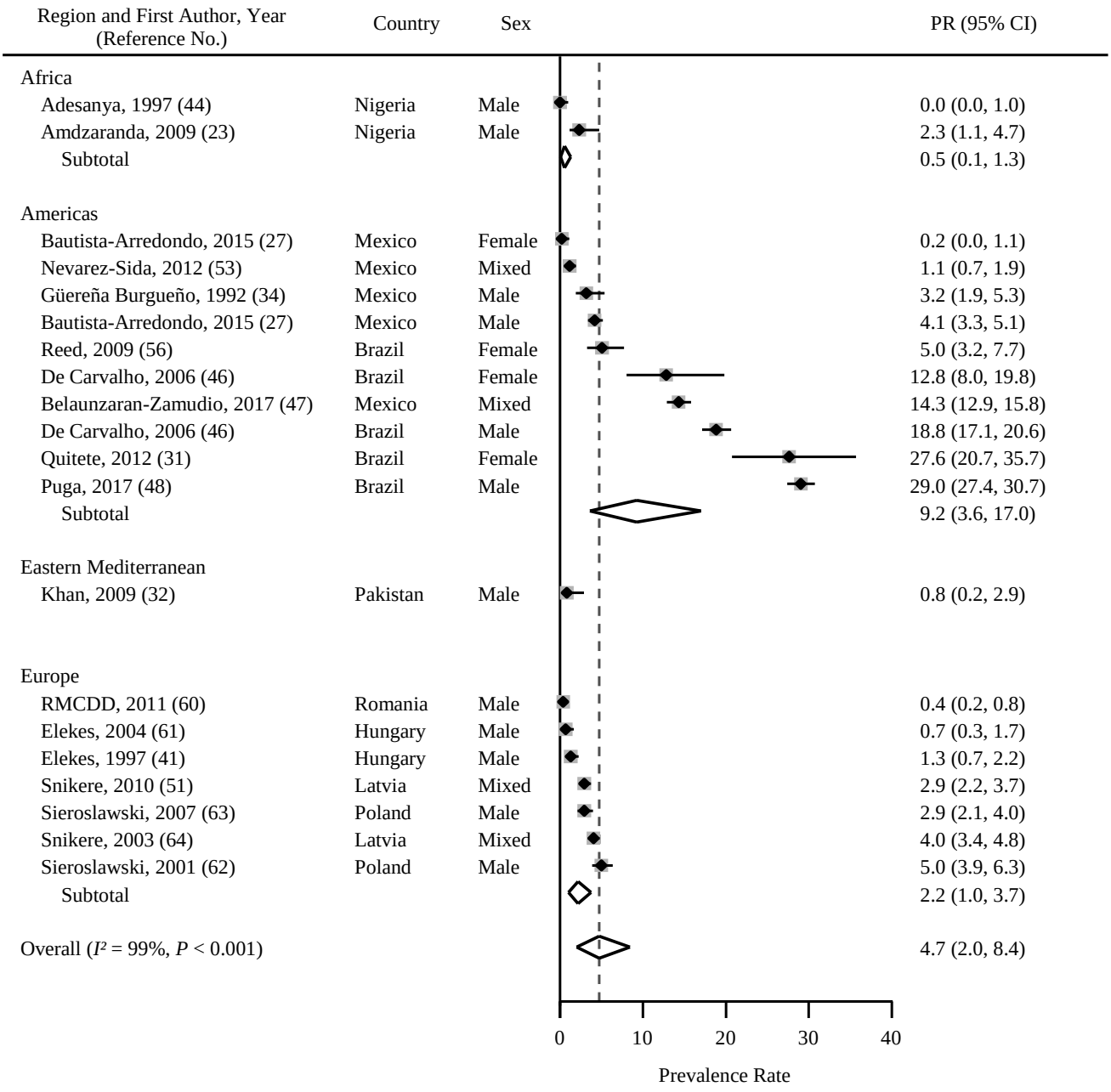
Substance	**Illicit drug use**							
Prevalence period	***Before imprisonment***				***During imprisonment***			
	Coefficient (ß)	95% CI		P	Coefficient (ß)	95% CI		P
		lower	upper			lower	upper	
Sex	0.058	-0.095	0.211	0.449	-0.041	-0.254	0.172	0.693
Age	-0.016	-0.048	0.016	0.318	0.003	-0.059	0.064	0.927
Sample size	-0.000061	-0.00012	-1.22e-06	0.046	-0.000012	-0.000099	0.0000751	0.772
Non-response rate	0.002	-0.0009	0.005	0.193	-0.003	-0.006	0.0006	0.108
Before imprisonment	n.a.				0.00010	-0.00013	0.00034	0.373
WHO-regions (Africa Reference category)								
Americas	0.185	-0.050	0.420	0.119	0.216	-0.094	0.527	0.163
Eastern Mediterranean	0.164	-0.097	0.424	0.213	0.378	-0.028	0.784	0.066
Europe	-0.095	-0.326	0.137	0.416	0.066	-0.236	0.367	0.653
South East Asia	-0.161	-0.453	0.131	0.272	Dropped	-	-	-
Western Pacific	-0.272	-0.567	0.023	0.070	Dropped	-	-	-



Web Figure 3. Prevalence rates and random effects meta-analyses of cannabis use during imprisonment in low- and middle-income countries by regions as defined by the World Health Organization, 1987-2017. CI, confidence interval; PR, prevalence rate.

Web Table 6. Meta-regression analyses of study characteristics and the prevalence of cannabis use among people who are imprisoned in low- and middle-income countries.

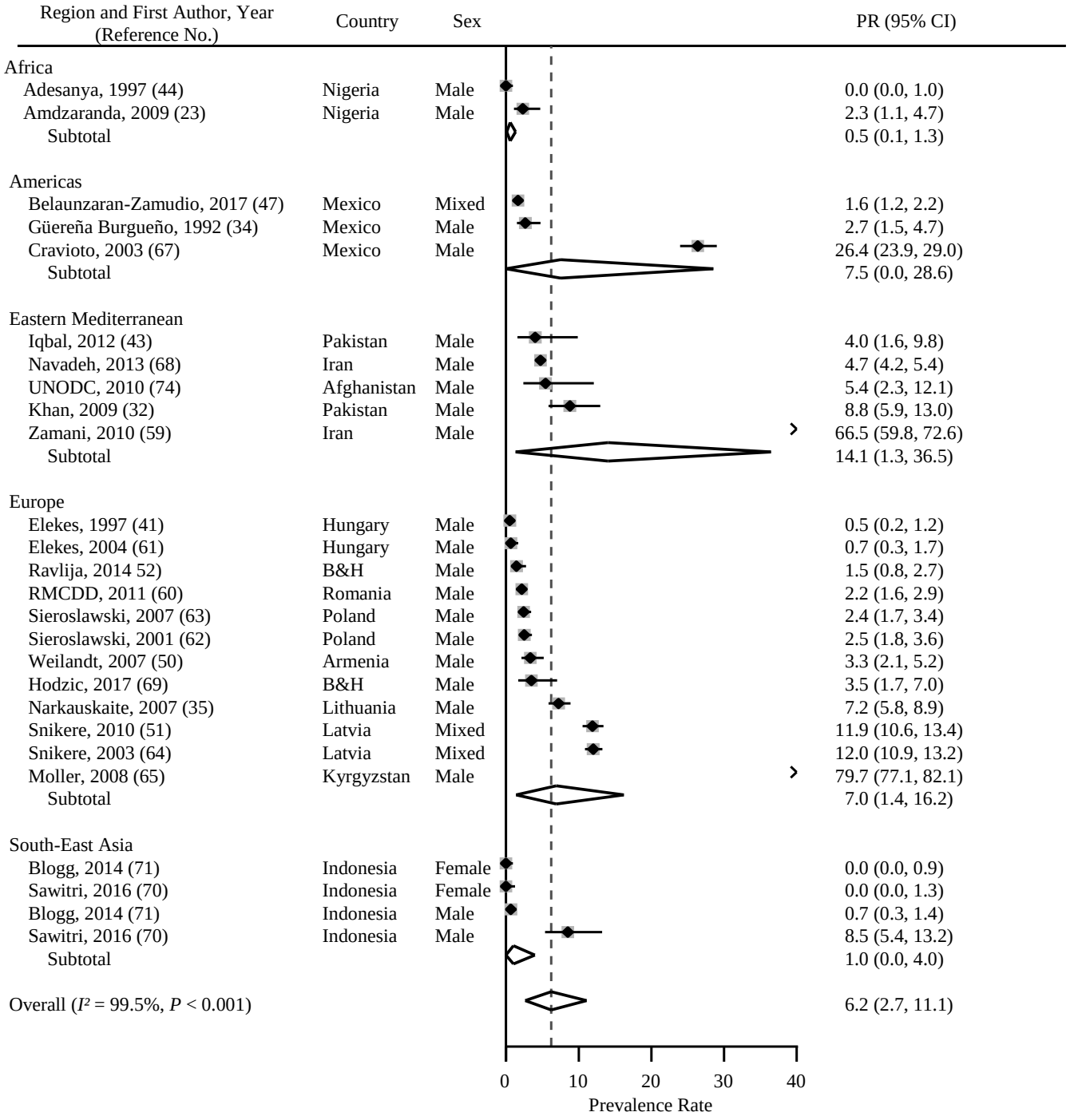
Substance	**Cannabis use**							
Prevalence period	***Before imprisonment***				***During imprisonment***			
	Coefficient (ß)	95% CI		P	Coefficient (ß)	95% CI		P
		lower	upper			lower	upper	
Sex	-0.157	-0.338	0.024	0.086	-0.043	-0.206	0.120	0.589
Age	-0.014	-0.069	0.041	0.605	-0.003	-0.024	0.018	0.779
Sample size	-0.0000431	-0.0001	0.00002	0.161	0.0000525	-9.43e-06	0.0001144	0.094
Non-response rate	0.004	-0.0001	0.009	0.056	0.002	-0.002	0.006	0.396
Before imprisonment	n.a.				0.00019	0.00013	0.00024	<**0.001**
WHO-regions (Africa Reference category)								
Americas	0.193	-0.005	0.391	0.056	0.145	0.007	0.284	**0.041**
Eastern Mediterranean	Dropped	-	-	-	0.087	-0.127	0.304	0.405
Europe	0.009	-0.189	0.206	0.928	0.067	-0.073	0.207	0.331
South East Asia	-0.185	-0.541	0.171	0.291	Dropped	-	-	-
Western Pacific	Dropped	-	-	-	Dropped	-	-	-
Multivariate meta-regression analyses retaining significant variables								
Before imprisonment					0.00018	0.00012	0.00023	<**0.001**
Americas					0.036	-0.054	0.126	0.404



Web Figure 4. Prevalence rates and random effects meta-analyses of cocaine use during imprisonment in low- and middle-income countries by regions as defined by the World Health Organization, 1987-2017. The dashed line indicates the overall pooled random effects prevalence. CI, confidence interval; PR, prevalence rate.

Web Table 7. Meta-regression analyses of study characteristics and the prevalence of cocaine use among people who are imprisoned in low- and middle-income countries.

Substance	**Cocaine use**							
Prevalence period	***Before imprisonment***				***During imprisonment***			
	Coefficient (ß)	95% CI		P	Coefficient (ß)	95% CI		P
		lower	upper			lower	upper	
Sex	-0.230	-0.407	-0.053	**0.013**	-0.032	-0.158	0.094	0.600
Age	-0.003	-0.058	0.053	0.918	-0.009	-0.028	0.011	0.341
Sample size	-0.00003	-0.00012	0.00005	0.464	0.0000365	-7.80e-06	0.0000808	0.100
Non-response rate	0.0003	-0.005	0.006	0.898	0.0004	-0.003	0.003	0.787
Before imprisonment	n.a.				0.00016	0.00009	0.00022	**<0.001**
WHO-regions (Africa Reference category)								
Americas	0.384	0.292	0.476	**<0.001**	0.103	-0.041	0.246	0.150
Eastern Mediterranean	Dropped	-	-	-	-0.003	-0.244	0.238	0.979
Europe	0.105	0.012	0.197	**0.029**	0.014	-0.132	0.160	0.843
South East Asia	Dropped	-	-	-	Dropped			-
Western Pacific	Dropped	-	-	-	Dropped			
Multivariate meta-regression analyses retaining significant variables								
Sex	0.011	-0.088	0.112	0.811				
Americas	0.389	0.291	0.488	**<0.001**				
Europe	0.104	0.010	0.198	**0.031**				



Web Figure 5. Prevalence rates and random effects meta-analyses of opiate use during imprisonment in low- and middle-income countries by regions as defined by the World Health Organization, 1987-2017. The dashed line indicates the overall pooled random effects prevalence. B&H, Bosnia and Herzegovina; CI, confidence interval; PR, prevalence rate.

Web Table 8. Meta-regression analyses of study characteristics and the prevalence of opiate use among people who are imprisoned in low- and middle-income countries.

Substance	**Opiate use**							
Prevalence period	***Before imprisonment***				***During imprisonment***			
	Coefficient (ß)	95% CI lower	95% CI upper	P	Coefficient (ß)	95% CI lower	95% CI upper	P
Sex	0.019	-0.099	0.138	0.743	0.111	-0.198	0.421	0.466
Age	0.006	-0.007	0.019	0.349	0.006	-0.032	0.043	0.759
Sample size	6.29e-06	-0.00003	0.00004	0.711	-8.02e-06	-0.0000872	0.0000712	0.836
Non-response rate	0.003	0.0009	0.005	**0.005**	-0.0008	-0.004	0.003	0.654
Before imprisonment	n.a.				0.0001843	0.0001167	0.000252	**<0.001**
WHO-regions (Africa Reference category)								
Americas	-0.0009	-0.139	0.137	0.989	0.092	-0.297	0.480	0.629
Eastern Mediterranean	0.178	0.054	0.301	**0.006**	0.170	-0.192	0.532	0.341
Europe	0.133	0.021	0.246	**0.022**	0.096	-0.231	0.422	0.550
South East Asia	0.020	-0.117	0.157	0.769	0.011	-0.361	0.382	0.953
Western Pacific	Dropped	-	-	-	Dropped	-	-	-
Multivariate meta-regression analyses retaining significant variables								
Non-response rate	0.0021	0.0005	0.0039	**0.013**				
Eastern Mediterranean	0.135	0.002	0.267	**0.046**				
Europe	0.115	-0.005	0.235	0.051				

Web Table 9. Meta-regression analyses of study characteristics and the prevalence of injection drug use among people who are imprisoned in low- and middle-income countries.

Substance	**Injection drug use**							
Prevalence period	***Before imprisonment***				***During imprisonment***			
	Coefficient (ß)	95% CI		P	Coefficient (ß)	95% CI		P
		lower	upper			lower	upper	
Sex	0.002	-0.084	0.088	0.959	0.016	-0.045	0.078	0.580
Age	0.009	-0.001	0.018	0.075	0.003	-0.005	0.011	0.376
Sample size	-6.19e-06	-0.00002	9.87e-06	0.443	-1.24e-06	-0.000017	0.00002	0.892
Non-response rate	0.002	-0.004	0.003	0.108	0.0006	-0.0007	0.002	0.337
Before imprisonment	n.a.				0.00007	-0.00005	0.00020	0.224
WHO-regions (Africa Reference category)								
Americas	0.094	-0.002	0.191	**0.054**	0.012	-0.060	0.085	0.727
Eastern Mediterranean	0.167	0.061	0.277	**0.003**	0.014	-0.069	0.100	0.727
Europe	0.195	0.093	0.297	**<0.001**	0.087	0.010	0.163	**0.028**
South East Asia	0.039	-0.087	0.167	0.533	0.013	-0.074	0.101	0.755
Western Pacific	0.013	-0.079	0.089	0.895	Dropped	-	-	-

Web Appendix 2. Nicotine use before imprisonment

Nicotine use before imprisonment was reported for 21 samples from 14 LMIC (24, 25, 27, 29, 33, 40-42, 61, 63, 78, 80, 82-87). The prevalence of nicotine use before imprisonment ranged from 33% to 93% (Web Figure 6). The heterogeneity between the studies was high (I^2 = 98.5%; P<0.001). Pooled rates indicate a prevalence of 70% (95% CI: 64, 76) for people in LMIC prisons. Nicotine use before imprisonment was significantly more frequent in imprisoned men (ß = 0.21; P = 0.04) as compared to women and in Europe (82%; ß = 0.278; P = 0.009) as compared to Africa (Web Table 3).

Web Appendix 3. Alcohol use before imprisonment

The prevalence rates of alcohol use before imprisonment were reported from 23 samples in 14 LMIC (24, 29, 33, 41, 44-47, 50, 51, 55, 61, 72, 75, 77, 78, 80-84). The prevalence of alcohol use before imprisonment ranged from 33% in Iran to 94% in Hungary (I^2 = 99.2%; P<0.001). The pooled prevalence of alcohol use before imprisonment was 71% (95% CI: 63, 78) for people imprisoned in LMIC (Web Figure 7). There were significant differences in the prevalence of alcohol use with respect to WHO-regions: lower rates in the Eastern Mediterranean (37%; ß = -0.278; P = 0.009) and higher rates in Europe (85%; ß = 0.151; P = 0.05) as compared to Africa (Web Table 4).

Web Appendix 4. Illicit drug use before imprisonment

There were 50 samples from 21 LMIC reporting prevalence estimates for illicit drug use before imprisonment (26, 27, 29, 34, 35, 38, 41, 42, 45, 47, 49, 51, 52, 54, 55, 58-61, 63-65, 67, 69, 71, 72, 77, 78, 80, 82, 84-98). Estimates for illicit drug use during imprisonment ranged from 9% for men imprisoned in China to 93% for men imprisoned in Iran (Web Figure 8). The heterogeneity between the studies was high (I^2 = 99.6%; P<0.001). Pooled rates of illicit drug use during imprisonment indicate a prevalence of 48% (95% CI: 41, 55) in LMIC. Meta-regression analyses did not show any significant association between study characteristics and illicit drug use before imprisonment (Web Table 5).

Web Appendix 5. Cannabis use before imprisonment

Prevalence estimates of cannabis use before imprisonment were reported for 24 samples in 12 LMIC (24, 27, 29, 40, 41, 44, 46, 47, 49-51, 55, 60- 64, 72, 77, 86, 99). Prevalence estimates for cannabis use before imprisonment ranged from 9% to 69% (Web Figure 9). The heterogeneity between the studies was high (I^2 = 99.6%; P<0.001). Pooled rates indicate a prevalence of 37% (95% CI: 28, 47) for cannabis use before imprisonment in LMIC. Study characteristics did not associate with cannabis use before imprisonment (Web Table 6).

Web Appendix 6. Cocaine use before imprisonment

Prevalence estimates of cocaine use during imprisonment were reported for 24 samples in 10 LMIC (24, 27, 40, 41, 44, 46, 47, 49, 51, 54, 55, 60-64, 72, 77, 86, 99, 100). Prevalence estimates for cocaine use during imprisonment ranged from 1% to 52% (Web Figure 10). The heterogeneity between the studies was high (I^2 = 99.4%; P<0.001). Pooled rates indicate that 23% (95% CI: 16, 30) of the people used cocaine before imprisonment in LMIC. Imprisoned women had higher rates cocaine use before imprisonment than imprisoned men (ß = -0.230, P = 0.01). The prevalence of cocaine use was significantly higher in the Americas (41.8%, ß = 0.345, P < 0.001) and in Europe (22.9%, ß = 0.105, P = 0.03) as compared to Africa (Web Table 7).

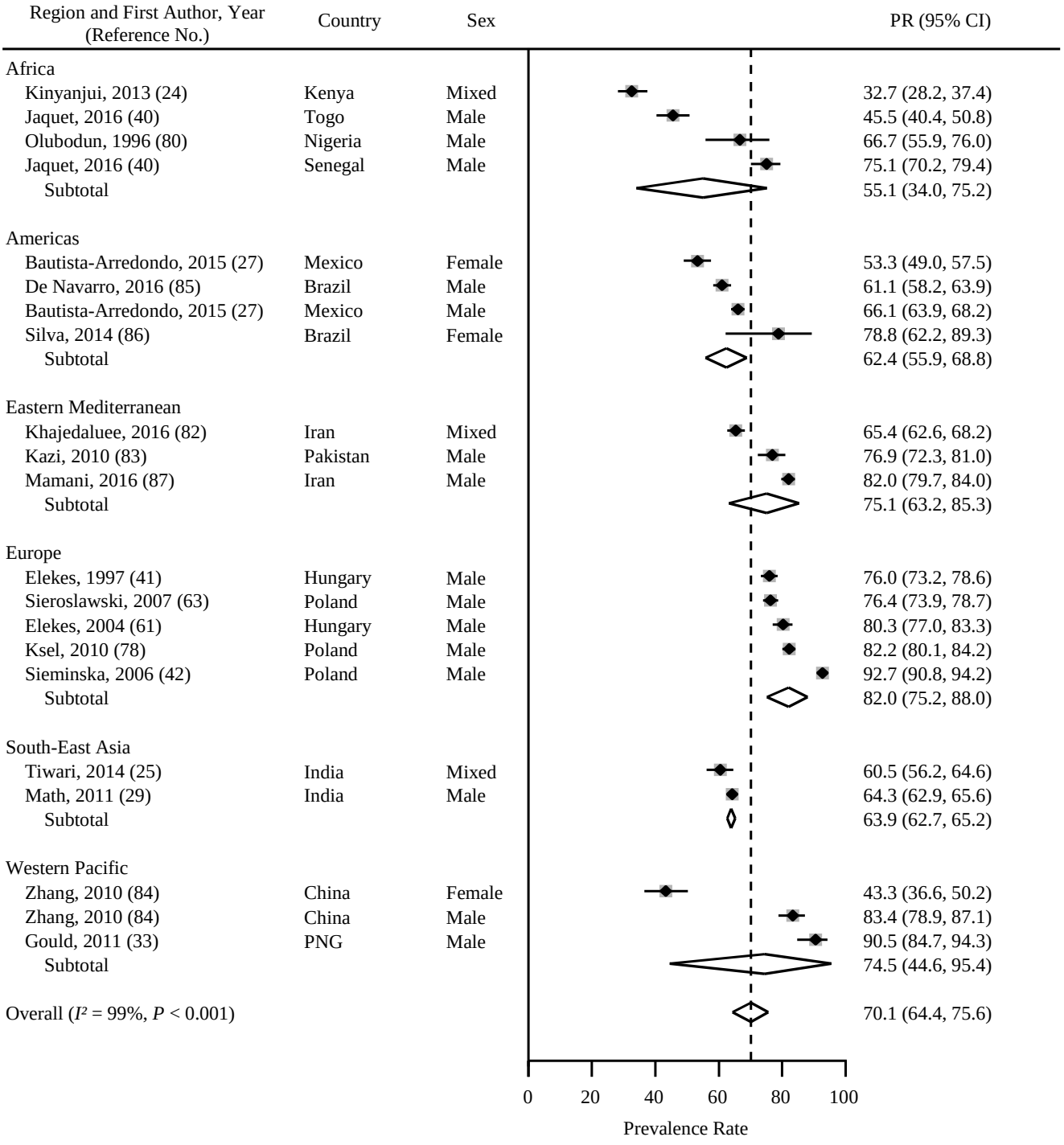
Web Appendix 7. Opiate use before imprisonment

Prevalence estimates of opiate use before imprisonment were reported for 37 samples in 22 LMIC (24, 26, 27, 29, 38, 40, 41, 44, 47, 49-52, 58, 60-64, 69, 71, 72, 76, 82, 83, 87, 94-96, 101-103). Prevalence estimates for opiate use before imprisonment ranged from 1% to 39% (Web Figure 11). The heterogeneity between the studies was high (I^2 = 99.3%; P<0.001). Pooled rates indicate a prevalence of 10% (95% CI: 3, 11) for opiate use before imprisonment in LMIC. The opiate use before imprisonment was positively associated with the non-response rate (ß = 0.003, P = 0.005). Rates of opiate use before imprisonment were significantly higher in the Eastern Mediterranean Region (18.1%, ß = 0.178, P = 0.006) and in Europe (15.5%, ß = 0.133, P = 0.02) (Web Table 8).

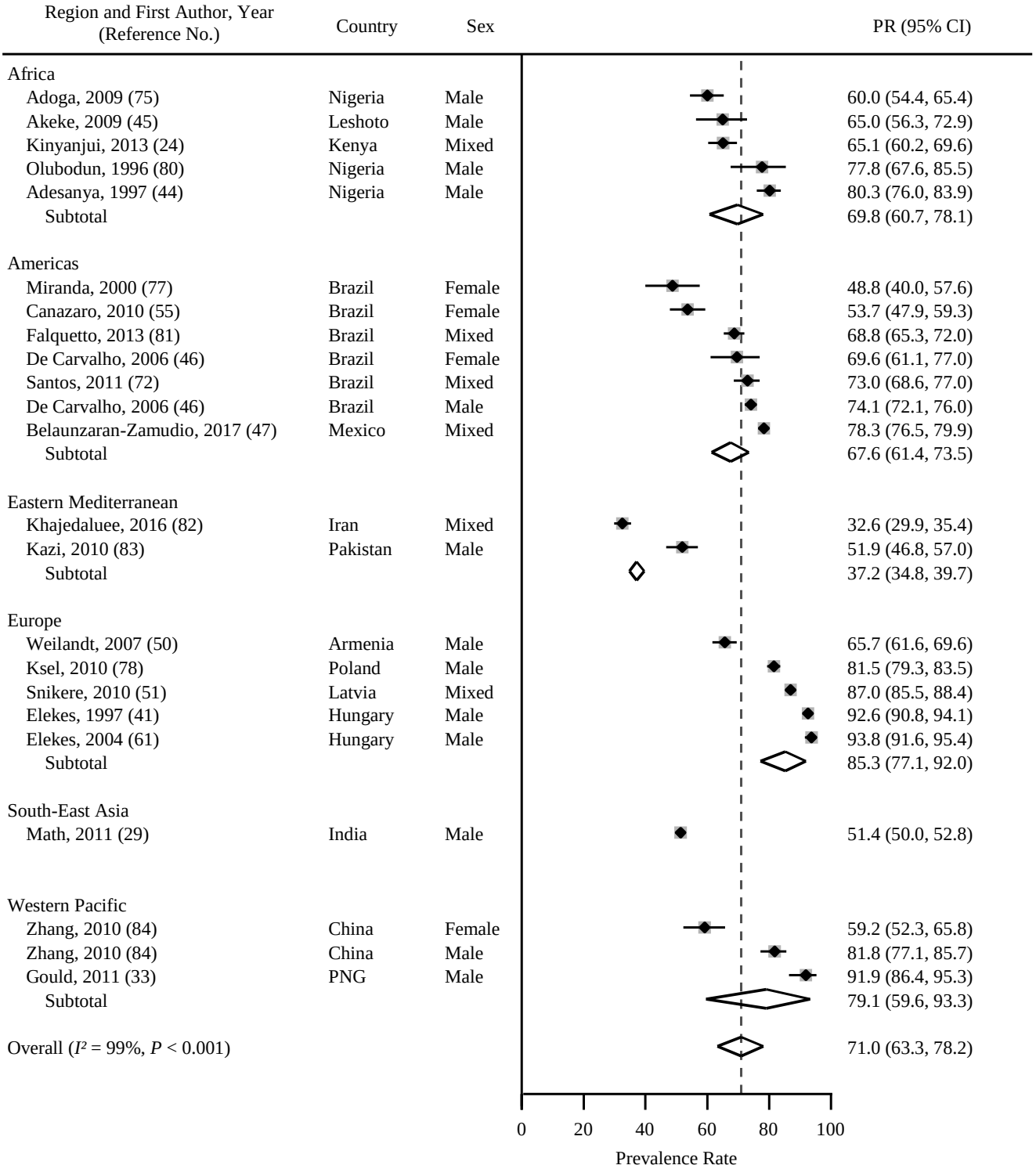
Web Appendix 8. Injection drug use before imprisonment

Estimates for injection drug use before imprisonment were reported for 55 samples from 27 LMIC (26, 27, 29, 32, 35, 38, 40, 41, 44-48, 50, 52, 54, 57, 59, 63, 66, 68-77, 81-83, 85, 87, 89, 91, 93-97, 99-106). Estimates for injection drug use before imprisonment ranged from 0% to 49% (Web Figure 12). The heterogeneity between the studies was high (I^2 = 99.3%; P<0.001). Pooled rates indicated a prevalence of

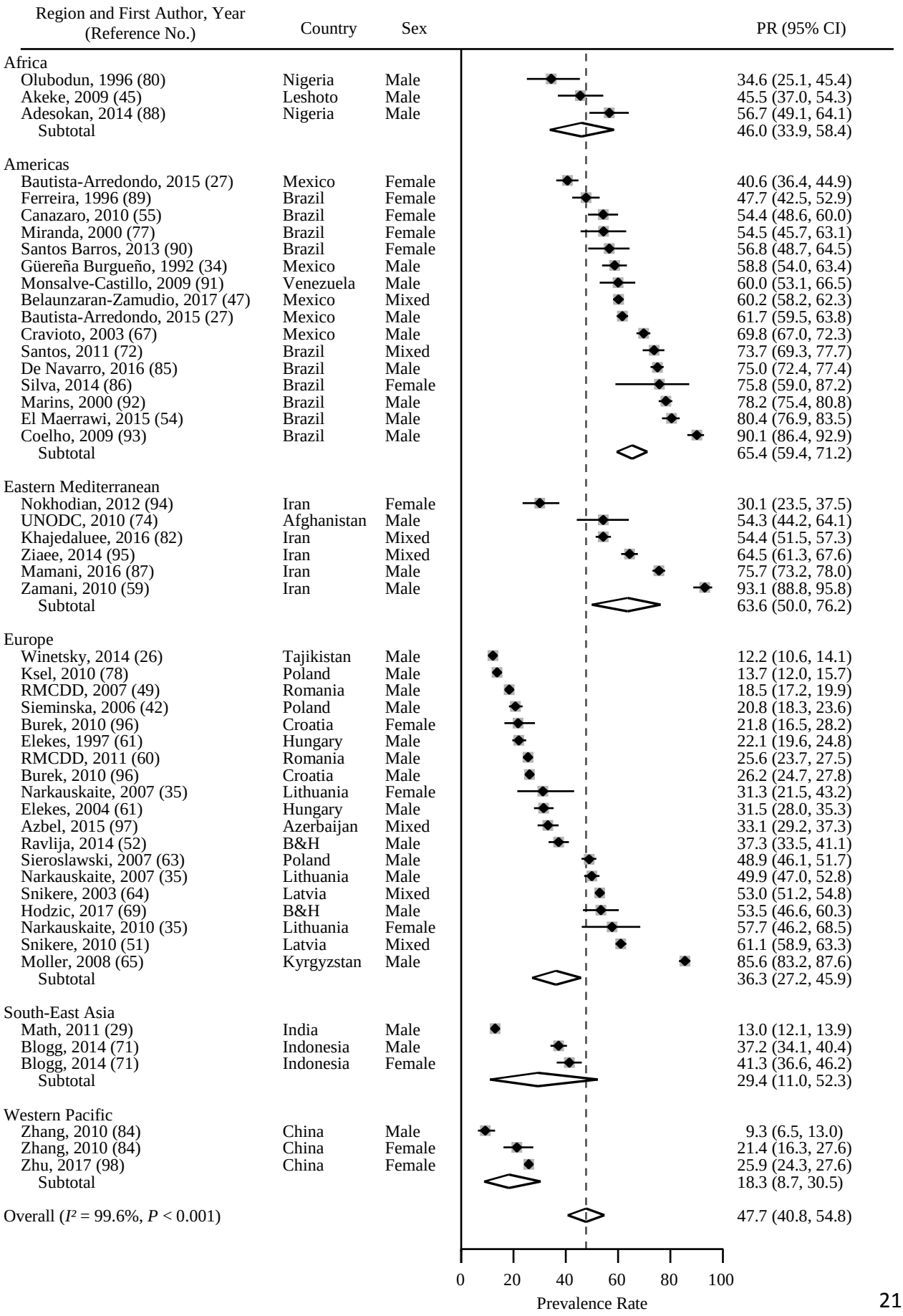
10% (95% CI: 7, 13) for injection drug use before imprisonment in LMIC. Injection drug use was significantly more frequent in the Americas (9.2%, ß = 0.094, *P* = 0.05), in the Eastern Mediterranean Region (15.7%, ß = 0.167, *P* = 0.003) and in Europe (18.5%, ß = 0.195, *P* = <0.001) as compared to Africa (Web Table 9).



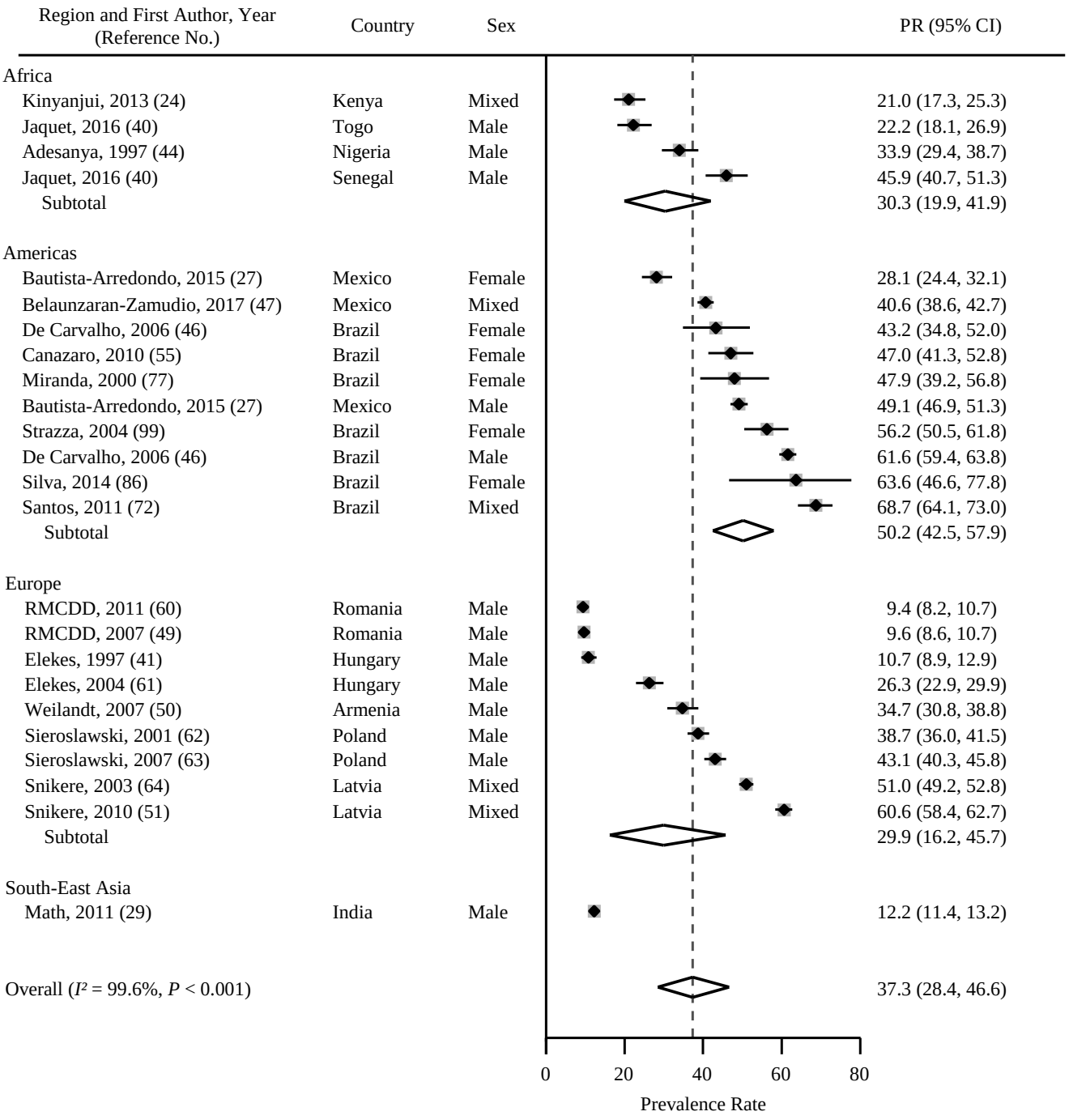
Web Figure 6. Prevalence of nicotine use before imprisonment in low- and middle-income countries by regions as defined by the World Health Organization, 1987-2017. The dashed line indicates the overall pooled random effects prevalence. CI, confidence interval; PGN, Papua New Guinea; PR, prevalence rate.



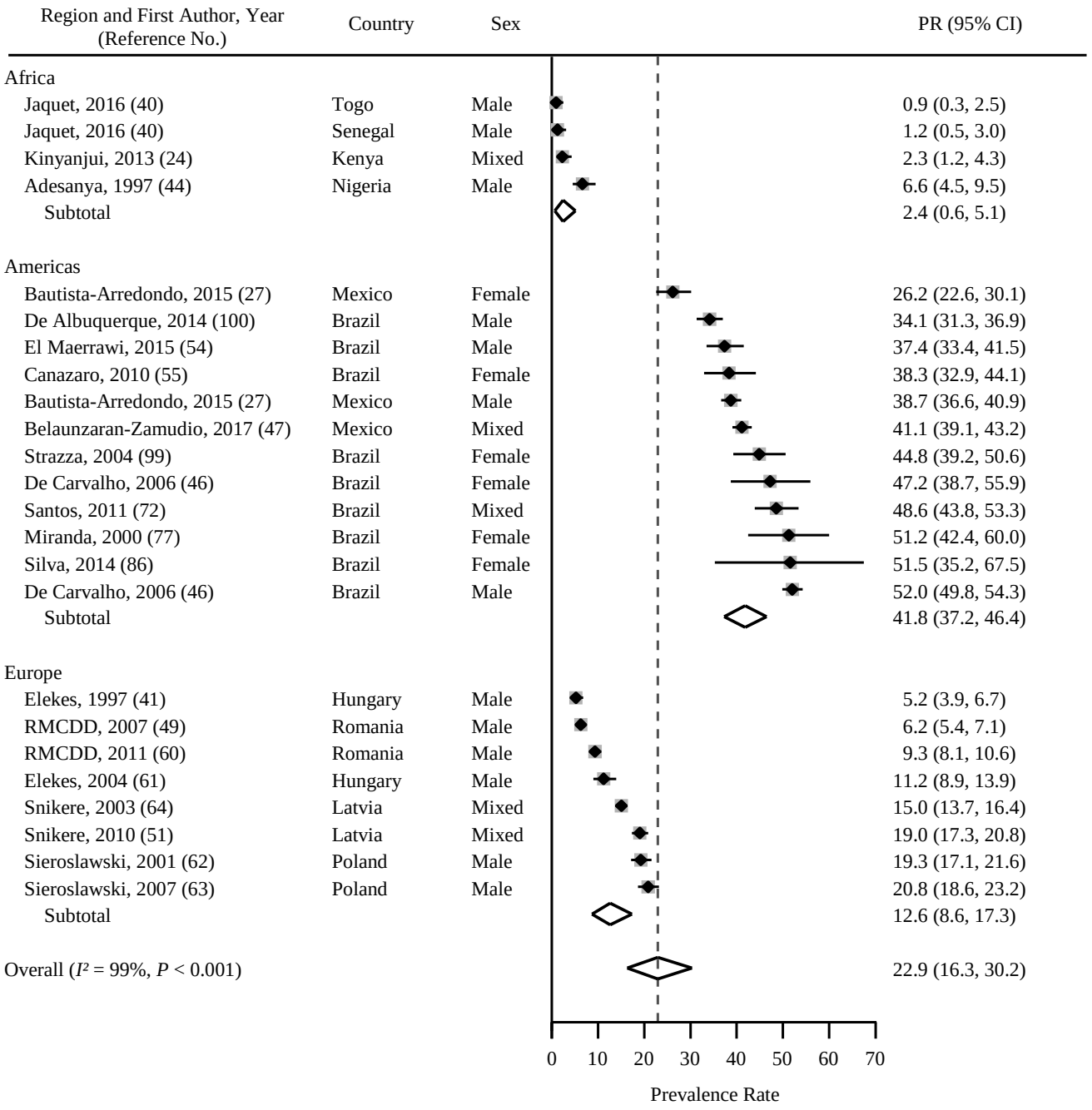
Web Figure 7. The prevalence of alcohol use before imprisonment in people who are imprisoned in low- and middle-income countries by regions as defined by the World Health Organization, 1987-2017. The dashed line indicates the overall pooled random effects prevalence. CI, confidence interval; PGN, Papua New Guinea; PR, prevalence rate.


Region and First Author, Year (Reference No.)
Country
Sex
PR (95% CI)
Africa
Olubodun, 1996 (80) Nigeria Male 34.6 (25.1, 45.4)
Akeke, 2009 (45) Leshoto Male 45.5 (37.0, 54.3)
Adesokan, 2014 (88) Nigeria Male 56.7 (49.1, 64.1)
Subtotal 46.0 (33.9, 58.4)
Americas
Bautista-Arredondo, 2015 (27) Mexico Female 40.6 (36.4, 44.9)
Ferreira, 1996 (89) Brazil Female 47.7 (42.5, 52.9)
Canazaro, 2010 (55) Brazil Female 54.4 (48.6, 60.0)
Miranda, 2000 (77) Brazil Female 54.5 (45.7, 63.1)
Santos Barros, 2013 (90) Brazil Female 56.8 (48.7, 64.5)
Güereña Burgueño, 1992 (34) Mexico Male 58.8 (54.0, 63.4)
Monsalve-Castillo, 2009 (91) Venezuela Male 60.0 (53.1, 66.5)
Belaunzaran-Zamudio, 2017 (47) Mexico Mixed 60.2 (58.2, 62.3)
Bautista-Arredondo, 2015 (27) Mexico Male 61.7 (59.5, 63.8)
Cravioto, 2003 (67) Mexico Male 69.8 (67.0, 72.3)
Santos, 2011 (72) Brazil Mixed 73.7 (69.3, 77.7)
De Navarro, 2016 (85) Brazil Male 75.0 (72.4, 77.4)
Silva, 2014 (86) Brazil Female 75.8 (59.0, 87.2)
Marins, 2000 (92) Brazil Male 78.2 (75.4, 80.8)
El Maerrawi, 2015 (54) Brazil Male 80.4 (76.9, 83.5)
Coelho, 2009 (93) Brazil Male 90.1 (86.4, 92.9)
Subtotal 65.4 (59.4, 71.2)
Eastern Mediterranean
Nokhodian, 2012 (94) Iran Female 30.1 (23.5, 37.5)
UNODC, 2010 (74) Afghanistan Male 54.3 (44.2, 64.1)
Khajedaluee, 2016 (82) Iran Mixed 54.4 (51.5, 57.3)
Ziaee, 2014 (95) Iran Mixed 64.5 (61.3, 67.6)
Mamani, 2016 (87) Iran Male 75.7 (73.2, 78.0)
Zamani, 2010 (59) Iran Male 93.1 (88.8, 95.8)
Subtotal 63.6 (50.0, 76.2)
Europe
Winetsky, 2014 (26) Tajikistan Male 12.2 (10.6, 14.1)
Ksel, 2010 (78) Poland Male 13.7 (12.0, 15.7)
RMCDD, 2007 (49) Romania Male 18.5 (17.2, 19.9)
Sieminska, 2006 (42) Poland Male 20.8 (18.3, 23.6)
Burek, 2010 (96) Croatia Female 21.8 (16.5, 28.2)
Elekes, 1997 (61) Hungary Male 22.1 (19.6, 24.8)
RMCDD, 2011 (60) Romania Male 25.6 (23.7, 27.5)
Burek, 2010 (96) Croatia Male 26.2 (24.7, 27.8)
Narkauskaite, 2007 (35) Lithuania Female 31.3 (21.5, 43.2)
Elekes, 2004 (61) Hungary Male 31.5 (28.0, 35.3)
Azbel, 2015 (97) Azerbaijan Mixed 33.1 (29.2, 37.3)
Ravlija, 2014 (52) B&H Male 37.3 (33.5, 41.1)
Sieroslawski, 2007 (63) Poland Male 48.9 (46.1, 51.7)
Narkauskaite, 2007 (35) Lithuania Male 49.9 (47.0, 52.8)
Snikere, 2003 (64) Latvia Mixed 53.0 (51.2, 54.8)
Hodzic, 2017 (69) B&H Male 53.5 (46.6, 60.3)
Narkauskaite, 2010 (35) Lithuania Female 57.7 (46.2, 68.5)
Snikere, 2010 (51) Latvia Mixed 61.1 (58.9, 63.3)
Moller, 2008 (65) Kyrgyzstan Male 85.6 (83.2, 87.6)
Subtotal 36.3 (27.2, 45.9)
South-East Asia
Math, 2011 (29) India Male 13.0 (12.1, 13.9)
Blogg, 2014 (71) Indonesia Male 37.2 (34.1, 40.4)
Blogg, 2014 (71) Indonesia Female 41.3 (36.6, 46.2)
Subtotal 29.4 (11.0, 52.3)
Western Pacific
Zhang, 2010 (84) China Male 9.3 (6.5, 13.0)
Zhang, 2010 (84) China Female 21.4 (16.3, 27.6)
Zhu, 2017 (98) China Female 25.9 (24.3, 27.6)
Subtotal 18.3 (8.7, 30.5)
Overall (I^2 = 99.6%, P < 0.001) 47.7 (40.8, 54.8)
0
20
40
60
80
100
Prevalence Rate

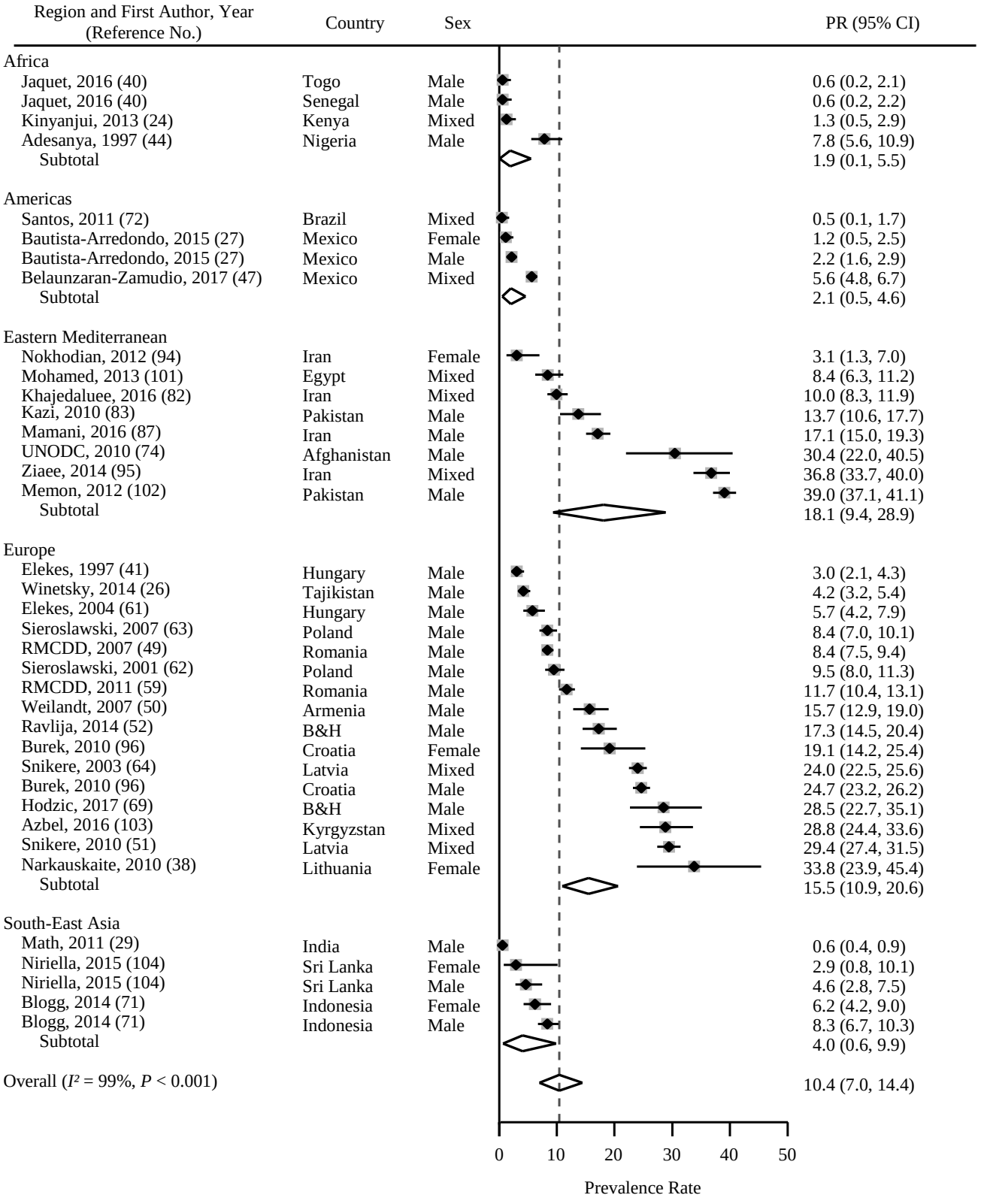
Web Figure 8. The prevalence of illicit drug use before imprisonment in low- and middle-income countries by regions as defined by the World Health Organization, 1987-2017. The dashed line indicates the overall pooled random effects prevalence. B&H, Bosnia and Herzegovina; CI, confidence interval; PR, prevalence rate.



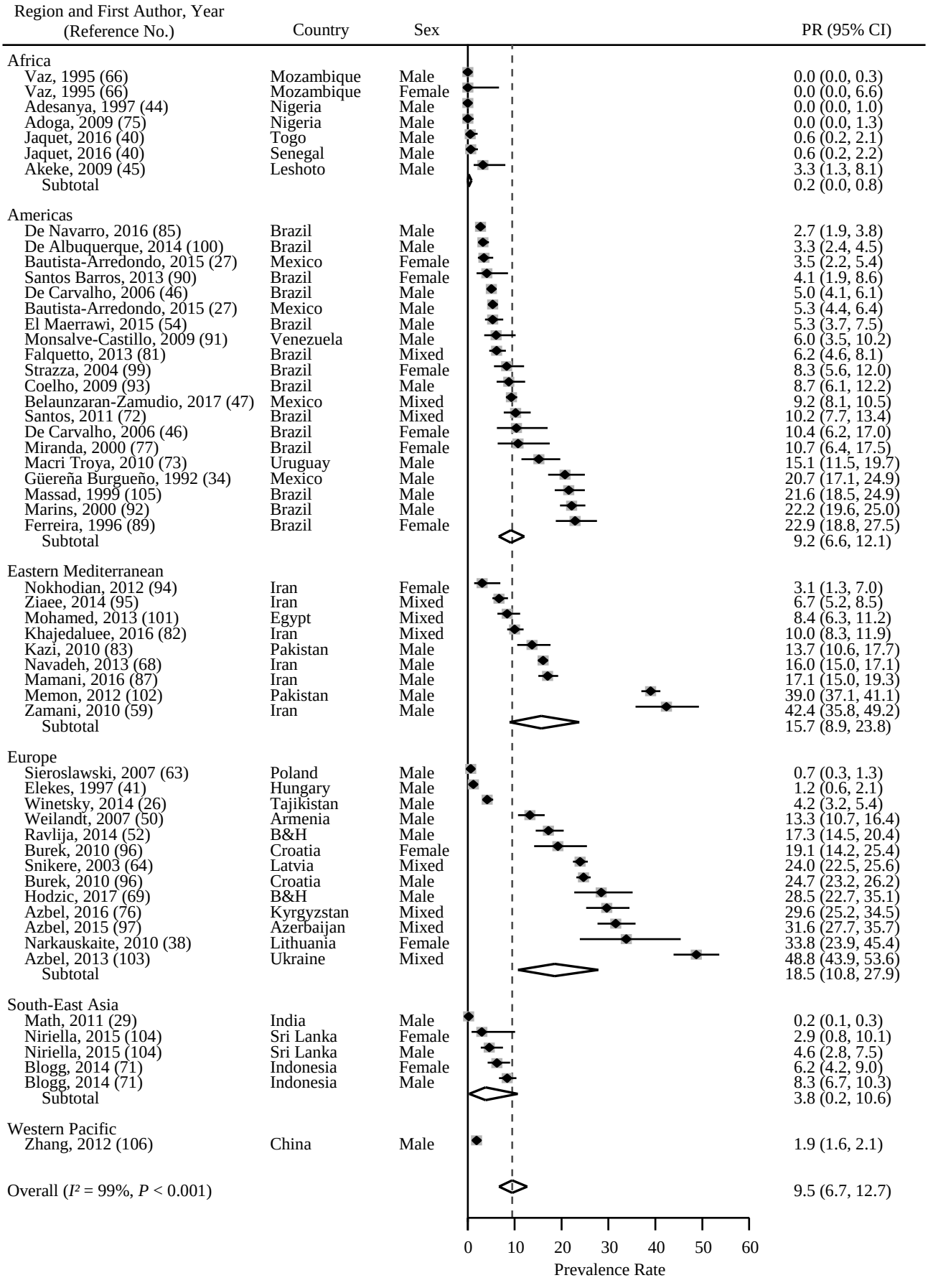
Web Figure 9. Random effects meta-analyses for the prevalence of cannabis use before imprisonment in low- and middle-income countries by regions as defined by the World Health Organization, 1987-2017. The dashed line indicates the overall pooled random effects prevalence. CI, confidence interval; PR, prevalence rate.



Web Figure 10. Random effects meta-analyses for the prevalence of cocaine use before imprisonment in low- and middle-income countries by WHO-Region, 1987-2017. The dashed line indicates the overall pooled random effects prevalence. CI, confidence interval; PR, prevalence rate.



Web Figure 11. Random effects meta-analyses for the prevalence of opiate use before imprisonment in low- and middle-income countries by regions as defined by the World Health Organization, 1987-2017. The dashed line indicates the overall pooled random effects prevalence. B&H, Bosnia and Herzegovina; CI, confidence interval; PR, prevalence rate.


Region and First Author, Year (Reference No.)
Country
Sex
PR (95% CI)
Africa
Vaz, 1995 (66) Mozambique Male 0.0 (0.0, 0.3)
Vaz, 1995 (66) Mozambique Female 0.0 (0.0, 6.6)
Adesanya, 1997 (44) Nigeria Male 0.0 (0.0, 1.0)
Adoga, 2009 (75) Nigeria Male 0.0 (0.0, 1.3)
Jaquet, 2016 (40) Togo Male 0.6 (0.2, 2.1)
Jaquet, 2016 (40) Senegal Male 0.6 (0.2, 2.2)
Akeke, 2009 (45) Leshoto Male 3.3 (1.3, 8.1)
Subtotal 0.2 (0.0, 0.8)
Americas
De Navarro, 2016 (85) Brazil Male 2.7 (1.9, 3.8)
De Albuquerque, 2014 (100) Brazil Male 3.3 (2.4, 4.5)
Bautista-Arredondo, 2015 (27) Mexico Female 3.5 (2.2, 5.4)
Santos Barros, 2013 (90) Brazil Female 4.1 (1.9, 8.6)
De Carvalho, 2006 (46) Brazil Male 5.0 (4.1, 6.1)
Bautista-Arredondo, 2015 (27) Mexico Male 5.3 (4.4, 6.4)
El Maerrawi, 2015 (54) Brazil Male 5.3 (3.7, 7.5)
Monsalve-Castillo, 2009 (91) Venezuela Male 6.0 (3.5, 10.2)
Falquetto, 2013 (81) Brazil Mixed 6.2 (4.6, 8.1)
Strazza, 2004 (99) Brazil Female 8.3 (5.6, 12.0)
Coelho, 2009 (93) Brazil Male 8.7 (6.1, 12.2)
Belaunzaran-Zamudio, 2017 (47) Mexico Mixed 9.2 (8.1, 10.5)
Santos, 2011 (72) Brazil Mixed 10.2 (7.7, 13.4)
De Carvalho, 2006 (46) Brazil Female 10.4 (6.2, 17.0)
Miranda, 2000 (77) Brazil Female 10.7 (6.4, 17.5)
Macri Troya, 2010 (73) Uruguay Male 15.1 (11.5, 19.7)
Güereña Burgueño, 1992 (34) Mexico Male 20.7 (17.1, 24.9)
Massad, 1999 (105) Brazil Male 21.6 (18.5, 24.9)
Marins, 2000 (92) Brazil Male 22.2 (19.6, 25.0)
Ferreira, 1996 (89) Brazil Female 22.9 (18.8, 27.5)
Subtotal 9.2 (6.6, 12.1)
Eastern Mediterranean
Nokhodian, 2012 (94) Iran Female 3.1 (1.3, 7.0)
Ziaee, 2014 (95) Iran Mixed 6.7 (5.2, 8.5)
Mohamed, 2013 (101) Egypt Mixed 8.4 (6.3, 11.2)
Khajedaluee, 2016 (82) Iran Mixed 10.0 (8.3, 11.9)
Kazi, 2010 (83) Pakistan Male 13.7 (10.6, 17.7)
Navadeh, 2013 (68) Iran Male 16.0 (15.0, 17.1)
Mamani, 2016 (87) Iran Male 17.1 (15.0, 19.3)
Memon, 2012 (102) Pakistan Male 39.0 (37.1, 41.1)
Zamani, 2010 (59) Iran Male 42.4 (35.8, 49.2)
Subtotal 15.7 (8.9, 23.8)
Europe
Sieroslawski, 2007 (63) Poland Male 0.7 (0.3, 1.3)
Elekes, 1997 (41) Hungary Male 1.2 (0.6, 2.1)
Winetsky, 2014 (26) Tajikistan Male 4.2 (3.2, 5.4)
Weilandt, 2007 (50) Armenia Male 13.3 (10.7, 16.4)
Ravlija, 2014 (52) B&H Male 17.3 (14.5, 20.4)
Burek, 2010 (96) Croatia Female 19.1 (14.2, 25.4)
Snikere, 2003 (64) Latvia Mixed 24.0 (22.5, 25.6)
Burek, 2010 (96) Croatia Male 24.7 (23.2, 26.2)
Hodzic, 2017 (69) B&H Male 28.5 (22.7, 35.1)
Azbel, 2016 (76) Kyrgyzstan Mixed 29.6 (25.2, 34.5)
Azbel, 2015 (97) Azerbaijan Mixed 31.6 (27.7, 35.7)
Narkauskaite, 2010 (38) Lithuania Female 33.8 (23.9, 45.4)
Azbel, 2013 (103) Ukraine Mixed 48.8 (43.9, 53.6)
Subtotal 18.5 (10.8, 27.9)
South-East Asia
Math, 2011 (29) India Male 0.2 (0.1, 0.3)
Niriella, 2015 (104) Sri Lanka Female 2.9 (0.8, 10.1)
Niriella, 2015 (104) Sri Lanka Male 4.6 (2.8, 7.5)
Blogg, 2014 (71) Indonesia Female 6.2 (4.2, 9.0)
Blogg, 2014 (71) Indonesia Male 8.3 (6.7, 10.3)
Subtotal 3.8 (0.2, 10.6)
Western Pacific
Zhang, 2012 (106) China Male 1.9 (1.6, 2.1)
Overall (I^2 = 99%, P < 0.001) 9.5 (6.7, 12.7)
0
10
20
30
40
50
60
Prevalence Rate

Web Figure 12: Random effects meta-analyses for the prevalence of injection drug use before imprisonment in low- and middle-income countries by regions as defined by the World Health Organization, 1987-2017. The dashed line indicates the overall pooled random effects prevalence. B&H, Bosnia and Herzegovina; CI, confidence interval; PR, prevalence rate.

Web Table 10. Samples reporting the prevalence of substance use for people imprisoned in low- and middle-income countries, 1987-2017. N.r., not reported.

First Author, Year (Reference No.)	Year of data collection (final)	Sex	Region (according to the WHO)	Country	Sample size	Non-response rate (%)	Mean Age (years)
Adesanya, 1997 (44)	1995	Male	Africa	Nigeria	395	4.8	30.4
Adesokan, 2014 (88)	2013	Male	Africa	Nigeria	164	n.r.	n.r.
Adoga, 2009 (75)	2007	Male	Africa	Nigeria	300	n.r.	29.2
Akeke, 2009 (45)	n.r.	Male	Africa	Leshoto	123	11.0	n.r.
Amdzaranda, 209 (23)	2006	Male	Africa	Nigeria	303	13.9	31.2
Azbel, 2013 (104)	2011	Mixed	Europe	Ukraine	402	5.6	31.9
Azbel, 2015 (97)	2014	Mixed	Europe	Azerbaijan	510	4.7	38.2
Azbel, 2016 (76)	2014	Mixed	Europe	Kyrgyzstan	368	3.4	37.4
Bautista-Arredondo, 2015 (27)	2010	Male	Americas	Mexico	1934	1.1	33.8
Bautista-Arredondo, 2015 (27)	2010	Female	Americas	Mexico	520	2.8	34.9
Belaunzaran-Zamudio, 2017 (47)	2012	Mixed	Americas	Mexico	2218	48.0	n.r.
Blogg, 2014 (71)	2010	Male	South-East Asia	Indonesia	900	6.0	32.0
Blogg, 2014 (71)	2010	Female	South-East Asia	Indonasia	402	5.0	34.0
Burek, 2010 (96)	2007	Female	Europe	Croatia	188	24.7	32.0
Burek, 2010 (96)	2007	Male	Europe	Croatia	3160	33.5	32.0
Canazaro, 2010 (55)	2008	Female	Americas	Brazil	287	22.0	33.4
Coelho, 2009 (93)	2003	Male	Americas	Brazil	333	n.r.	30.1
Cravioto, 2003 (67)	2000	Male	Americas	Mexico	1151	4.7	n.r.
Dadi, 2016 (39)	2015	Mixed	Africa	Ethiopia	649	7.3	30.6
De Albuquerque, 2014 (100)	2011	Male	Americas	Brazil	1097	0.3	28.6
De Carvalho, 2006 (46)	1998	Male	Americas	Brazil	1914	n.r.	30.1

De Carvalho, 2006 (46)	1998	Female	Americas	Brazil	125	n.r.	32.9
De Navarro, 2016 (85)	2013	Male	Americas	Brazil	1120	25.0	29.0
Diendere, 2011 (57)	2009	Male	Africa	Burkina Faso	300	n.r.	30.1
El Maerrawi, 2015 (54)	2007	Male	Americas	Brazil	546	16.0	29.8
Elekes, 1997 (41)	1997	Male	Europe	Hungary	951	4.9	n.r.
Elekes, 2004 (61)	2004	Male	Europe	Hungary	609	0.0	34.5
Falquetto, 2013 (81)	2010	Mixed	Americas	Brazil	730	18.5	n.r.
Ferreira, 1996 (89)	1993	Female	Americas	Brazil	350	7.4	29.0
Gould, 2011 (33)	2010	Male	Western Pacific	Papua New Guinea	148	41.7	31.0
Güereña Burgueño, 1992 (34)	1988	Male	Americas	Mexico	410	2.0	29.0
Hodzic, 2017 (69)	2013	Male	Europe	Bosnia and Herzegovina	200	73.9	32.3
Hussain, 2003 (28)	2001	Male	Eastern Mediterranean	Pakistan	425	0.0	34.8
Iqbal, 2012 (43)	2006	Male	Eastern Mediterranean	Pakistan	100	0.0	35.0
Jaka, 2014 (30)	2013	Mixed	Europe	Albania	401	n.r.	31.4
Jaquet, 2016 (40)	2013	Male	Africa	Togo	347	13.6	30.0
Jaquet, 2016 (40)	2014	Male	Africa	Senegal	333	13.6	30.0
Kazi, 2010 (83)	2008	Male	Eastern Mediterranean	Pakistan	364	5.2	27.0
Khajedaluee, 2016 (82)	2008	Mixed	Eastern Mediterranean	Iran	1114	5.2	35.1
Khan, 2009 (32)	2008	Male	Eastern Mediterranean	Pakistan	250	n.r.	44.0
Kinyanjui, 2013 (24)	2011	mixed	Africa	Kenya	395	n.r.	33.3
Ksel, 2010 (78)	2003	Male	Europe	Poland	1305	n.r.	n.r.
Macri Troya, 2010 (73)	2005	Male	Americas	Uruguay	291	0.0	29.6
Mamani, 2016 (87)	2013	Male	Eastern Mediterranean	Iran	1208	51.7	n.r.
Marins, 2000 (92)	1995	Male	Americas	Brazil	914	13.7	29.0

Massad, 1999 (105)	1994	Male	Americas	Brazil	631	5.5	30.8
Math, 2011 (29)	2009	Male	South-East Asia	India	5024	3.4	30.7
Memon, 2012 (102)	2008	Male	Eastern Mediterranean	Pakistan	2285	n.r.	42.5
Miranda, 2000 (77)	1997	Female	Americas	Brazil	121	0.8	30.2
Mohamed, 2013 (101)	n.r.	Mixed	Eastern Mediterranean	Egypt	500	n.r.	41.0
Moller, 2008 (65)	2005	Male	Europe	Kyrgyzstan	1004	1.0	32.6
Monsalve-Castillo, 2009 (91)	n.r.	Male	Americas	Venezuela	200	n.r.	31.6
Naik, 2014 (37)	n.r.	Male	South-East Asia	India	1600	0.0	n.r.
Narkauskaite, 2007 (35)	2003	Male	Europe	Lithuania	1122	86.5	27.8
Narkauskaite, 2007 (35)	2003	Female	Europe	Lithuania	67	86.5	34.4
Narkauskaite, 2010 (38)	2009	Female	Europe	Lithuania	71	72.2	34.0
Navadeh, 2013 (68)	2009	Male	Eastern Mediterranean	Iran	4536	17.9	n.r.
Nevárez-Sida, 2012 (53)	2006	Mixed	Americas	Mexico	1223	10.0	n.r.
Niriella, 2015 (103)	n.r.	Male	South-East Asia	Sri Lanka	325	0.8	42.0
Niriella, 2015 (103)	n.r.	Female	South-East Asia	Sri Lanka	68	0.8	42.0
Nokhodian, 2012 (94)	2009	Female	Eastern Mediterranean	Iran	163	0.0	34.5
Olubodun, 1996 (80)	n.r.	Male	Africa	Nigeria	81	3.6	27.7
Puga, 2017 (48)	2014	Male	Americas	Brazil	2848	10.7	31.6
Puga, 2017 (48)	2014	Female	Americas	Brazil	520	10.7	31.1
Quitete, 2012 (31)	n.r.	Female	Americas	Brazil	134	3.6	31.5
Ravlija, 2014 (52)	2011	Male	Europe	Bosnia and Herzegovina	620	n.r.	34.0
Reed, 2009 (56)	n.r.	Female	Americas	Brazil	377	27.3	n.r.
Romanian Monitoring Centre for Drugs and Drug Addiction (RMCDD), 2007 (49)	2010	Male	Europe	Romania	2064	n.r.	n.r.

Romanian Monitoring Centre for Drugs and Drug Addiction (RMCDD), 2011 (60)	2006	Male	Europe	Romania	3218	n.r.	n.r.
Santos, 2011 (72)	2010	Mixed	Americas	Brazil	422	18.7	32.7
Santos Barros, 2013 (90)	2008	Female	Americas	Brazil	148	1.3	n.r.
Sawitri, 2016 (70)	2009	Male	South-East Asia	Indonesia	200	n.r.	32.8
Sawitri, 2016 (70)	2009	Female	South-East Asia	Indonesia	300	n.r.	32.8
Sieminska, 2006 (42)	n.r.	Male	Europe	Poland	907	0.0	32.3
Sieroslawski, 2001 (62)	2001	Male	Europe	Poland	1189	n.r.	n.r.
Sieroslawski, 2007 (63)	2007	Male	Europe	Poland	1240	11.9	n.r.
Silva, 2014 (86)	2013	Female	Americas	Brazil	33	26.6	n.r.
Sniķere, 2003 (64)	2003	Mixed	Europe	Latvia	2867	38.8	n.r.
Sniķere, 2010 (51)	2010	Mixed	Europe	Latvia	1965	56.9	31.7
Strazza, 2004 (99)	2000	Female	Americas	Brazil	290	3.0	31
Tiwari, 2014 (25)	n.r.	Mixed	South-East Asia	India	506	41.5	35.8
Turan, 2015 (36)	2013	Male	Europe	Turkey	109	13.5	37.2
United Nations Office on Drugs and Crime (UNODC), 2009 (74)	2008	Mixed	Africa	Uganda	459	8.2	n.r.
United Nations Office on Drugs and Crime (UNODC), 2010 (58)	n.r.	Male	Eastern Mediterranean	Afghanistan	92	n.r.	n.r.
Vaz, 1995 (66)	1991	Male	Africa	Mozambique	1284	43.6	26.2
Vaz, 1995 (66)	1991	Female	Africa	Mozambique	54	27.0	29.2
Weilandt, 2007 (50)	n.r.	Male	Europe	Armenia	542	2.5	33.7
Winetsky, 2014 (26)	2010	Male	Europe	Tajikistan	1317	2.4	36.0
Zamani, 2010 (59)	2007	Male	Eastern Mediterranean	Iran	203	n.r.	34.8
Zhang, 2010 (84)	2006	Male	Western Pacific	China	313	2.0	30.4
Zhang, 2010 (84)	2006	Female	Western Pacific	China	201	2.0	30.5
Zhang, 2012 (106)	2011	Male	Western Pacific	China	12380	n.r.	n.r.
Zhu, 2017 (98)	2013	Female	Western Pacific	China	2709	7.1	n.r.

Ziaee, 2014 (95)	2010	Mixed	Eastern Mediterranean	Iran	881	2.1	34.7

Web Table 11. Pooled **fixed-effects** prevalence estimates of substance use before and during imprisonment in low- and middle-income countries. CI, confidence interval.

Substance	Before imprisonment			During imprisonment		
	Prevalence (%)	95% CI		Prevalence (%)	95% CI	
		Lower	Upper		Lower	Upper
Nicotine use	70.1	69.5	70.8	56.7	56.2	57.6
Alcohol use	69.5	68.8	70.1	14.0	13.5	14.4
Illicit drug use	40.5	40.0	40.9	23.1	22.6	23.6
Cannabis use	31.0	30.5	31.6	20.5	20.0	21.0
Cocaine use	20.9	20.4	21.4	6.2	5.9	6.5
Opiate use	10.6	10.3	10.9	6.4	6.1	6.7
Injection drug use	7.4	7.2	7.6	1.9	1.7	2.0